

REMARKS

In a non-final Office Action dated June 6, 2007, the Examiner rejected the claims as indefinite, rejected the claims as patentably indistinct over US Patent Nos. 7,049,074 and 6,509,158, rejected the claims as anticipated by US Patent No. 6,265,153, and rejected the claims as obvious over a combination of US Patent Nos. 6,265,153 and 6,762,059.

Applicants respond to each of the Examiner's rejections below. In view of the amendments noted above and the remarks presented herein, Applicants respectfully request reconsideration of the merits of this application.

Restriction Requirement

On February 26, 2007, Applicants' representative, elected Group I (Claims 1-70) with traverse in a Response to Requirement for Restriction. The Examiner made the restriction final and withdrew Claims 71-94 from prosecution.

Priority Claim

The Examiner alleged that the limitation "periodically reversing the flow to cause the polymeric molecules to hover in an elongated/aligned state" is not sufficiently supported in the priority documents. As such, Claims are 10-16, 32-28 and 49-70 are afforded a priority date of October 17, 2003, the application filing date.

Non-statutory Obviousness-Type Double Patenting

The Examiner rejected Claims 1, 4-7, 17, 25, 28-31, 39 and 45-48 as patentably indistinct from Claim 1 of US Patent No. 7,049,074 to Schwartz (hereinafter Schwartz I). Likewise, the Examiner rejected Claims 1, 3-7, 17, 23-25, 27-31, 39 and 45-48 as patentably indistinct from Claims 1-2, 10, 12-13, 15-16 and 26-27 of US Patent No. 6,509,158 to Schwartz (Schwartz II). The Examiner alleged that Schwartz I and Schwartz II disclose methods of characterizing nucleic acids by imaging nucleic acids that have been elongated and fixed on a solid planar surface that render the pending claims obvious. Applicants respectfully disagree.

The pending claims are directed toward methods of elongating polymeric molecules by using only laminar flow. In contrast, Schwartz I and Schwartz II claim methods of preparing nucleic acid molecules elongated and fixed for manipulation by depositing such molecules on a

planar surface having a positively charge substance. While both patents show laminar flow devices (*see, e.g.*, FIG. 25 of either Schwartz I or Schwartz II) for use with such methods, neither disclosed using only laminar flow with these devices for elongating nucleic acid molecules. In contrast to the claimed methods, Schwartz I and Schwartz II use flow-based techniques (*see* Section 5.1.3) incorporating gel inserts and electric fields for elongating nucleic acid molecules. Laminar flow was subsequently used merely to move the elongated nucleic acid molecules into the device for viewing or manipulation (*i.e.*, fixing to the planar surface) (*see*, FIG. 25). Applicants were the first to appreciate that one could use only laminar flow to elongate nucleic acid molecules. Because neither Schwartz I nor Schwartz II disclose or contemplate using only laminar flow to elongate nucleic acid molecules, they cannot render the pending claims obvious. In view of these remarks, Applicants respectfully request reconsideration of this rejection as applied to the pending claims.

Rejections Under 35 U.S.C. § 112

The Examiner rejected Claims 19 and 41 under 35 U.S.C. § 112, second paragraph, as indefinite. The Examiner alleged that the phrase "applying an acceleration" is unclear, particularly with respect to applying an acceleration to the width of a microchannel. Applicants respectfully disagree.

Applicants amend Claims 19 and 41 to recite that a centrifugal force is applied across the width of the microchannel. Support for this amendment is located in disclosed in paragraphs [0030] and [0097] of the application. In view of these amendments, Applicants respectfully request reconsideration of this rejection as applied to Claims 19 and 41.

Rejections Under 35 U.S.C. § 102

The Examiner rejected Claims 1-9, 17-18, 21-31, 39-40, 43-46, 48 and 58-64 under 35 U.S.C. § 102(e) as anticipated by US Patent No. 6,265,153 to Bensimon *et al.* The Examiner alleged that Bensimon *et al.* teaches a method of elongating polymeric molecules between two cover slips that anticipates the pending claims. Applicants respectfully disagree.

Bensimon *et al.* does not disclose every limitation and element as recited in the pending claims. Specifically, MPEP § 2131 provides:

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987) (noting that the identical invention must be shown in as complete detail as is contained in the claims) (emphasis added); *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed.Cir. 1989) (noting that the elements must be arranged as required by the claim).

Bensimon *et al.* does not disclose using laminar flow and microchannels to elongate polymeric molecules, such as nucleic acid molecules. The Examiner herself acknowledged that Bensimon *et al.* used two cover slips. *See, e.g.*, pp. 8-9 of the Office Action. Two cover slips, however, have no side constraints, and therefore cannot form a microchannel, which has at least a bottom and sides, as is shown, *e.g.*, in Applicants' Figures. The structures formed by a pair of cover slips in Bensimon *et al.* lack sides and therefore cannot be microchannels.

More importantly, the fluid dynamics of Bensimon *et al.* are opposite to those of Applicants. Applicants use (and claim) laminar flow at the leading edge of a solution to cause the polymeric molecule to adhere to the micro-channel surface. In contrast, Bensimon *et al.* disclose using capillary action/convection (principally caused by evaporation at the trailing edge of a solution) to create a meniscus that aligns polymeric molecules attached to a surface. *See* FIG. 6 of Bensimon *et al.* and column 2, lines 59-68; column 17, lines 41-45; and column 19, lines 30-32; as well as Example 1, column 1, lines 39-46. Bensimon *et al.* teaches away from using laminar flow by expressly noting that the flow types used by Applicants are not as efficient as a meniscus. *See* column 4, lines 7-20. Paragraph [0050] of the application contrasts the differences between laminar and capillary flow/convection.

Likewise, Applicants' laminar flow method has an advantage over capillary action/convection, in that it permits simultaneous attachment and alignment of polymeric molecules. *See* paragraph [0029] of the application. In contrast, Bensimon *et al.* discloses that they first "anchored [the macromolecule] on the surface and then uniformly aligned [it] by the passage of the meniscus." *See* column 4, line 7 to column 5, line 17. Consequently, Bensimon *et al.* does not anticipate the pending claims. In view of these remarks, Applicants respectfully request reconsideration of this rejection as applied to Claims 1-9, 17-18, 21-31, 39-40, 43-46, 48 and 58-64

Rejections Under 35 U.S.C. § 103

The Examiner rejected Claims 10-16, 20, 32-38, 42, 49-57 and 65-70 under 35 U.S.C. § 103(a) as obvious over Bensimon *et al.*, *supra*, in view of US Patent No. 6,762,059 to Chan *et al.* The Examiner alleged that although Bensimon *et al.* do not disclose polymeric molecule stretching and elongation by periodically reversing flow in a microchannel, it would have been obvious to an ordinary skilled artisan after reading Chan *et al.* Applicants respectfully disagree.

As noted above, Bensimon *et al.* fails to contemplate or disclose microchannels and teaches away from laminar flow methods. As such, Applicants reiterate their previous remarks and point out that Bensimon *et al.* cannot render the claims obvious, since the elements of pending Claim 1 are neither anticipated by, nor obvious in view of, Bensimon *et al.*

Chan *et al.* does not cure the deficiencies of Bensimon *et al.* Chan *et al.* discloses methods of measuring the velocity of polymeric molecules, such as nucleic acid molecules, with devices having structures (funnels, posts, branches and serial structures) that elongate nucleic acids. *See* FIGS. 3-4, 11-24, and 36; *see also*, Column 15, lines 42-62; Example 5.4.1; and Example 5.5.1 of Chan *et al.* More importantly, these structures necessarily prevent laminar flow. Thus, Chan *et al.* did not use laminar flow to uncoil nucleic acids for subsequent analysis. In contrast, the methods and devices of the present invention utilize laminar flow to uncoil nucleic acid molecules.

In support of Chan *et al.*, the Examiner cited Column 40, lines 41-67. The Examiner alleged that this passage disclosed a step of periodically reversing flow to cause a polymeric molecule, like a nucleic acid molecule, to hover in an elongated state. However, and as acknowledged by the Examiner herself (*see, e.g.*, third full paragraph on p. 16 of the Office Action), Chan *et al.* used an electrical field to move polymeric molecules in solution. The passage states that the "polymers then follow electric field lines instead of flow lines." Thus, Chan *et al.* do not actually reverse solution flow. In fact, this passage teaches away from Applicants' methods, as Chan *et al.* note that solution flow in the opposite direction can be damaging to stretching. In contrast, the claimed methods use solution flow, not an electrical field, to cause the nucleic acid to hover. While an electric field may be used, it is only to adsorb polymeric molecules to a wall of a microchannel. As such, Chan *et al.* does not contemplate or disclose periodically reversing flow to cause a polymeric molecule to hover and therefore does not render Claims 1, 25 and 48 or the claims that depend therefrom obvious. In view of these

remarks, Applicants respectfully request reconsideration of this rejection as applied to Claims 10-16, 20, 32-38, 42, 49-57 and 65-70.

Fees

No fee is believed due in connection with this submission. However, if a fee is due, in this or any subsequent response, please charge the fee to Deposit Account No. 17-0055. Likewise, no extension of time is believed due, but should any extension be required in this or any subsequent response, please consider this to be a petition for the appropriate extension of time and a request to charge the petition fee due to the same Deposit Account.

Respectfully submitted,

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